

Uninterruptible DC Power System

BACKGROUND OF THE INVENTION

1. Field of the invention

The present invention relates to an uninterruptible DC power system, (DC UPS) and more particularly, to an uninterruptible DC power system to be served as an emergency power source which is capable of effectively reducing the line loss when applied to electric appliances attached with AC/DC switchable power suppliers(SW power).

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2. Description of the Prior Art

Utility electric power is relied on by common domestic consumers as their power source for electric appliances. In case of the occurrence of abnormal states such as power outage, an undervoltage, or a over voltage, or an abnormal frequency, the user's loads loose their power supply so that the untrerruptible power system (UPS) whose battery unit normally under floating charge state from the utility source takes over the responsibility for an emergency source to supply the emergency power to those user's loads which have lost the utility power supply.

Normally, the power output of a conventional UPS is in the form of AC. The operational principle of an UPS is inputting the AC utility power by way of an AC to DC converter so as to store the DC energy in the UPS by a DC charging circuit, and then supplies the stored DC electric power to the loads by converting

back to AC when the utility power is out thereby serving as a stand
by power source. Meanwhile, in the aforesaid UPS scheme, the
electric power is firstly converted from AC to DC, and then
converted back from DC to AC, through repeated conversion of
5 electric power as such, the electrical circuits used for such repeated
conversion of power become complicated with increased circuit loss
as well.

Therefore, an invention devoting to resolving aforesaid
disadvantages of current UPS so as to upgrade the quality of the
10 UPS is definitely necessary. The present inventor has delved into
this matter with long time efforts and come to realization of the
present invention.

SUMMARY OF THE INVENTION

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It is a first object of the present invention to provide a newly
developed DC UPS which is capable of reducing electric power loss
during conversion so as to improve the efficiency and effectiveness
of the system, and start a lighting equipment in case the utility AC
20 voltage becomes abnormal.

It is a second object of the present invention to provide a newly
developed DC UPS which is capable of maintaining a stable output
voltage without being influenced by the input source.

It is a third object of the present invention to provide a newly
25 developed DC UPS which is capable of performing power
conversion by only one stage so as to minimized the complexity of
the circuit scheme and also improve environmental conscious
effect.

embodiment of the present invention; and

Fig. 5 is an illustrative diagram in which the DC UPS of the present invention is applied to an AC/DC switchable power supplier (SW power).

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The DC UPS provided by the present invention is well
10 applicable to an electrical appliance using the SW power as its power supplier so as to reduce circuit loss due to power conversion and improve system efficiency and saving energy by only one stage conversion.

Except the complexity in the circuit design is minimized, the
15 invention further contributes to environmental security protection and maintaining a stable output voltage.

Referring to Fig.1 and Fig.3, in which a layout scheme (Fig.1) and an electric circuit diagram (Fig.3) of the DC USP in a first embodiment of the present invention are shown. This embodiment
20 belongs to an ON-LINE system which essentially comprises a lighting equipment 10, an AC voltage and frequency detecting circuit 11, an AC to DC conversion and charging circuit 12, a battery unit 13, a DC voltage conversion circuit 14, a load detecting circuit 15, an output voltage detecting circuit 16, an
25 inner system power source 17, a controller circuit 18, and a switch

19. So far there is an utility AC available, a signal is delivered to the controller circuit 18 from the AC voltage and frequency detecting circuit 11 to actuate the AC to DC conversion and charging circuit 12 and the switch 19 for outputting DC power and
 5 charging the battery unit 13.

After finishing charging the battery unit 13, a notification signal is sent to the controller circuit 18 for interrupting the charging circuit 12 so as to protect the battery unit 13. In case the voltage, or frequency etc. of the utility AC power is found to be
 10 abnormal, the controller circuit 18 is informed by the AC voltage and frequency detecting circuit 11 of this state so as to start operation of the DC voltage conversion circuit 14 for continuously supplying power to the loads thereby attaining the uninterrupted power supply, and turn on the lighting equipment 10 to illuminate
 15 surroundings.

The inner system power source 17 is for supplying power to the inner components of UPS. Besides, the controller circuit 18 can control the output voltage at a predetermined value according to the detected results obtained by the output voltage detecting
 20 circuit 16. And, the load detecting circuit 15 is for detecting whether there is an overloading at the output terminal and informing the controller circuit 18 of the detected results.

In the first embodiment, in addition to servicing for the electric appliances equipped with the SW power, a DC to AC
 25 inverter may be added to the present invention for supplying AC power to other appliances which have no attached SW power.

Referring to Fig.2 and Fig.4, in which a layout scheme (Fig.2) and an electric circuit diagram (Fig.4) of the UPS in a second embodiment of the present invention are shown. This embodiment belongs to an OFF-LINE system which essentially comprises a lighting equipment 20, an AC voltage and frequency detecting and charging circuit 21, a battery unit 22, a DC to AC conversion circuit 23, a load detecting circuit 24, and output voltage detecting circuit 25, an inner system power source 26, a controller circuit 27, and an electromagnetic switch 28. So far there is an utility AC input, the AC voltage and frequency detecting and charging circuit 21 delivers a signal to the battery unit 22 informing that it is to be charged and informing the controller circuit 27 for actuating the electromagnetic switch 28 to output an AC power.

When finished charging of the battery unit 22, a signal is sent to the controller circuit 27 to stop charging so as to protect the battery unit 22 from being overcharged. In case the voltage, or frequency etc. of the utility AC power is found to be abnormal, the controller circuit 27 is informed by the AC voltage and frequency detecting and charging circuit 21 of this state so as to start operation of the DC voltage conversion circuit 23 and the electromagnetic switch 28 continuously supplying power to the loads thereby attaining the aim of uninterrupted power supply.

The inner system power source 26 is for supplying power to the inner components of UPS. Besides, the controller circuit 27 can control the output voltage at a predetermined value according

to the detected results obtained by the output voltage detecting circuit 25. And, the load detecting circuit 24 is for detecting whether there is an overloading at the output terminal and informing the controller circuit 27 of the detected results.

5 In the second embodiment, in addition to servicing for the appliances equipped with the SW power, a DC to AC inverter may be added to the present invention for supplying AC power to other appliances which have no attached SW power.

Referring to the illustrative diagram shown in Fig. 5 in which
10 the UPS of the present invention is applied to an AC/DC switchable power supplier(SW power). If the utility AC power supply is working normally, the power is stored in a battery unit 31 after AC to DC conversion. In case the utility power fails to keep its normal state which being detected by a detecting circuit
15 32, a controller circuit 33 sends a signal to an electromagnetic switch 35 of a SW power 34 which actuates a DC voltage conversion circuit 36 to produce a high DC voltage. This high DC voltage is stepped down to a low voltage DC as an output power via another DC voltage conversion circuit 37.

20 It emerges from the description of the above embodiments that the invention has several noteworthy advantages which are not found in any conventional UPS, in particular;

1. The power loss in conversion is reduced which leads to energy saving and improving system efficiency.
- 25 2. The output voltage is not affected by variation of the input voltage so that the UPS of the present invention can always

maintain a stable output voltage.

3. Power conversion is performed through only one stage so that the circuit scheme is simplified which also results in an environmental conscious effect.

- 5 4. In addition to taking over the mission of continuously supplying power to the loads, the UPS of the present invention is capable of turning on its lighting equipment so as to illuminate surroundings.

- 10 Only two preferred embodiments of the present invention are exemplified to shown its versatility and novelty, it is to be understood that the present invention is capable of use in various other combination and environments and is capable of changes or modification within the scope of inventive concept as expressed in appended claims.

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